WHAT IS CLAIMED IS:

1. A method for manufacturing a perpendicular magnetic recording head comprising the steps of:

(a) forming an auxiliary magnetic pole layer using a magnetic material;

(b) forming a coupling layer with a magnetic material on the auxiliary magnetic pole layer behind a face that serves as an opposing face opposing a recording medium;

(c) forming a coil layer in the region behind the face that serves as an opposing face opposing the recording medium;

(d) laminating an insulation layer on the auxiliary magnetic pole layer;

(e) forming an inorganic insulation layer having a main magnetic pole forming groove on the insulation layer, the inner width of the groove in a track width direction gradually increasing in accordance with the distance from the auxiliary magnetic pole layer on the opposing face portion, and the main magnetic pole forming groove having a given depth from the opposing face to the back of the opposing face;

(f) forming a main magnetic pole layer in the main magnetic pole forming groove; and

(g) magnetically coupling the main magnetic pole layer and the coupling layer directly or by forming yoke layers on the main magnetic pole layer and coupling layer.

2. A method for manufacturing a perpendicular magnetic recording head according to Claim 1, wherein the step (e) further comprises the steps of:

laminating a lift-off resist layer on the insulation layer;

depositing the inorganic insulation layer into a cut portion formed on the lower face of the resist layer using the lift-off resist layer as a mask from a perpendicular direction relative to the surface of the insulation layer or from a direction with a given angle relative to the perpendicular direction; and

forming an inorganic insulation layer having the main magnetic pole forming groove by removing the resist layer, the inner width of the groove in the track width direction gradually increasing in accordance with the distance from the auxiliary magnetic pole layer, and the groove having a given depth from the opposing face to the back of the opposing face.

3. A method for manufacturing a perpendicular magnetic recording head according to Claim 1, wherein the step (e) further comprises the steps of:

sequentially depositing an inorganic insulation layer on the insulation layer;

forming, on the inorganic insulation layer, a resist layer having an etching groove with side faces inclined

relative to the track width direction by heat-treating the resist layer or by adjusting the pattern forming accuracy of the groove after forming the resist layer having a patterned groove; and

forming the main magnetic pole layer forming groove on the inorganic insulation layer by engraving the inorganic insulation layer by etching using the resist layer as a mask, the inner width of the groove in the track width direction gradually increasing in accordance with the distance from the auxiliary magnetic pole layer, and the groove having a given depth from the opposing face opposing the back of the opposing face.

4. A method for manufacturing a perpendicular magnetic recording head according to Claim 1, wherein the step (e) further comprises the steps of:

sequentially depositing an inorganic insulation layer on the insulation layer; and

forming the main magnetic pole forming groove on the inorganic insulation layer by engraving the inorganic insulation layer by etching using the resist layer as a mask after forming, on the inorganic insulation layer, the resist layer having a patterned etching groove with side faces that are perpendicular to or inclined relative to the track width direction, the inner width of the groove in the track width direction gradually increasing in accordance with the distance from the auxiliary magnetic pole layer, and the

groove having a given depth from the opposing face to the back of the opposing face.

5. A method for manufacturing a perpendicular magnetic recording head according to Claim 1, wherein the step (f) further comprises the step of forming the main magnetic pole layer by a film deposition process such as sputtering or vacuum deposition.

6. A method for manufacturing a perpendicular magnetic recording head according to Claim 5 comprising the step of forming the main magnetic pole layer by masking the surface areas of the insulation layer and inorganic insulation layer except the main magnetic pole forming groove after forming the main magnetic pole forming groove, and embedding a magnetic material within the main magnetic pole forming groove by a film deposition process followed by removing the resist layer.

7. A method for manufacturing a perpendicular magnetic recording head according to Claim 1, wherein the step (e) further comprises the steps of depositing the inorganic insulation layer on the insulation layer with a plating underlayer therebetween, followed by forming the main magnetic pole forming groove so as to expose the plating underlayer, and

the step (f) further comprises the step of forming the

main magnetic pole layer by plating.

8. A method for manufacturing a perpendicular magnetic recording head according to Claim 7 further comprising, between the steps (f) and (g), the step (h) of planarizing the surface of the main magnetic pole layer by milling by which milling particles are projected from a direction inclined by a given angle relative to the center line of the main magnetic pole layer.

9. A method for manufacturing a perpendicular magnetic recording head according to Claim 8, wherein the step (h) further comprises the step of adjusting the given angle to 35° or more and 80° or less.

10. A method for manufacturing a perpendicular magnetic recording head according to Claim 8, wherein the step (h) further comprises the step of adjusting the given angle to 40° or more and 50° or less.

11. A method for manufacturing a perpendicular magnetic recording head according to Claim 7, wherein the step (h) further comprises the step of forming the plating underlayer using a nonmagnetic material.

12. A method for manufacturing a perpendicular magnetic recording head according to Claim 11 further

comprising, at the same time as or after the step (h), the step (i) of removing the plating underlayer by milling by which milling particles are projected from a direction inclined by a given angle relative to the center line of the main magnetic pole layer except the lower layer of the inorganic insulation layer on which the main magnetic pole forming groove has been formed.